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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Johan Olof Anders Robertsson

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SCHLUMBERGER-DOLL RESEARCH

ATTN: INTELLECTUAL PROPERTY LAW DEPARTMENT

P.O. BOX 425045

CAMBRIDGE, MA 02142

EXAMINER

CHARIOUI, MOHAMED

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/593,599	Applicant(s) ROBERTSSON, JOHAN OLOF ANDERS	
	Examiner MOHAMED CHARIOUI	Art Unit 2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 July 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 September 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>2/13/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. **Claims 1-12** are objected to because of the following informalities:

In claim 1, lines 1-5, change

“A method of decomposing a seismic wavefield, wherein a 3D wavefield is obtained by a cross-line acquisition and filtered applying a decomposition filter having two spatial directions to obtain a decomposed wavefield.”

to

-A method of decomposing a seismic wavefield comprising:

obtaining a 3D wavefield by a cross-line acquisition; and

filtering said 3D wavefield by applying a decomposition filter having two spatial directions to obtain a decomposed wavefield.-

Appropriate correction is required.

Claim 2 is objected to because of the following informalities:

In claim 2, line 2, change “up- / down going” to –up or down going-.

Appropriate correction is required.

Claim 3 is objected to because of the following informalities:

In claim 3, lines 2-4, change “in-line (k_x) and cross-line components (k_y) or a spatial representation of the in-line (k_x) and cross-line components (k_y).”

to -in-line component (k_x) and cross-line component (k_y) or a spatial representation of the in-line component (k_x) and cross-line component (k_y).-

Appropriate correction is required.

Claim 10 is objected to because of the following informalities:

In claim 10, line 3, change "to generated" to -to generate-. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 6, 7, 9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Baeten et al. (U.S. Patent Number 6,446,009).

As per claim 1, Baeten et al. teach decomposing a seismic wavefield , wherein a 3D wavefield is obtained by a cross-line acquisition and filtered applying a decomposition filter having two spatial directions (i.e. in-line and cross-line) to obtain a decomposed wavefield (see col. 2, lines 61-65; col. 3, lines 10-20; col. 5, lines 3-24; col. 5, lines 48-64; and Fig. 7).

As per claim 2, Baeten et al. further teach that the decomposition is for at least one of a group consisting of up/down going decomposition, P/S decomposition, elastic decomposition and acoustic decomposition (see col. 4, lines 5-15; col. 2, lines 61-65; and col. 1, lines 5-25).

As per claim 3, Baeten et al. further teach that the filter comprises in-line and cross-line components or a spatial representation of the in-line and cross-line components (see col. 5, lines 3-24 and col. 5, lines 48-64).

As per claim 6, Baeten et al. further teach that the filter filters an obtained pressure wavefield (i.e. hydrophones are pressure sensors) (see col. 1, lines 5-25 and col. 1, lines 46-65).

As per claim 7, Baeten et al. further teach that the filter exclusively filters an obtained pressure wavefield (see col. 1, lines 54-64).

As per claim 9, Baeten et al. further teach that the step of applying the filter is followed by a step of removing multiples (i.e. ground roll and random noise from a component of the decomposed wavefield (see col. 1, line 60 through col. 2, line 25).

As per claim 10, Baeten et al. further teach that the step of applying the filter is followed by a step of imaging or migrating the filtered wavefield to generated an image of subterranean formations (see col. 1, line 65 through col. 2, line 10).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over Baeten et al. in view of Garibotto (U.S. Patent Number 4,277,834).

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Baeten et al. teach the filter as stated above except that the filter is applied as a cascade filter.

Garibotto teaches cascaded filters for phase shifting and approximating the wave field detected by the acoustic sensors (see col. 4, lines 37-64; col. 12, lines 43-65; col. 14, lines 60-67; and col. 1, line 65 through col. 2, line 68). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate Garibotto's teaching into Baeten et al. because it would accurately estimate the change in the wave field. Therefore, accurate analysis of the seismic data would be performed to determine the geological formation of the area of interest.

4. **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Baeten et al. in view of Tuanyi et al. (1997 IEEE International Conference on Intelligent Processing Systems; Title " Seismic Data Time-Frequency Domain Filter with Wavelet Transform, pages 1223-1226).

Baeten et al. teach the filter as stated above except that the filter is a compact filter.

Tuanyi et al. teach compact support filter to decompose and reconstruct the seismic signals (see pages 1224-1225, paragraph III). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate Tuanyi et al.'s teaching into Baeten et al. because it would filter the high frequency noise. Therefore, accurate analysis of the seismic signal would be performed to determine the geological formation of the area of interest.

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5. **Claims 8, 11 and 12** are rejected under 35 U.S.C. 103(a) as being unpatentable over Baeten et al. in view of Sen et al. (U.S. Patent Number 6,654,693).

As per claim 8, Baeten et al. teach applying decomposition filter to obtain a decomposed wavefield as stated above.

Baeten et al. fail to clearly teach that applying the filter is preceded by a calibration step to match geophone recordings with hydrophone recordings.

Sen et al. teach calibrating the hydrophone data and the geophone data so that the delayed source function is optimized (see col. 2, lines 27-40; col. 4, line 52 through col. 5, line 64; and col. 6, lines 17-44). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate Sen et al.'s teaching into Baeten et al. because it would suppress the angle of propagating waves so that the recorded hydrophone data and recorded the geophone data would correspond to the same measured wavefiled. Therefore, accurate analysis of the seismic signal would be performed to determine the geological formation of the area of interest.

As per claim 11, Baeten et al. teach receivers (hydrophones and geophones) for collecting seismic data of subsurface structures located over water (see col. 1, lines 10-26).

Baeten et al. fail to clearly teach that the receivers are located on the sea floor.

Sen et al. teach plurality of sensor pair 24 attached to cable 20 located on the marine bottom 22 for receiving reflected wave representing subterranean formations (see col. 3, line 60 through col. 4, line 16 and Fig. 1). It would have been obvious to

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one having ordinary skill in the art at the time the invention was made to incorporate Sen et al.'s teaching into Baeten et al. because it would receive the reflected waves that characterize the sea floor subterranean formations. Therefore, analysis of the received data would be made to determine the geological configuration of the under sea subterranean area of interest.

As per claim 12, Baeten et al. teach receivers (hydrophones and geophones) for collecting seismic data of subsurface structures located over water (see col. 1, lines 10-26).

Baeten et al. fail to clearly teach that the receivers are towed by a vessel.

Sen et al. teach the system 10 that includes a seismic ship 18 that tows receivers 24 attached to cable 20 (see col. 3, line 60 through col. 4, line 16 and Fig. 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate Sen et al.'s teaching into Baeten et al. because the receivers would receive the reflected waves that characterize the sea floor subterranean formations. Therefore, processing and analysis of these reflected waves would be performed to determine the geological configuration of the under sea subterranean area of interest.

Prior art

6. The prior art made record and not relied upon is considered pertinent to applicant's disclosure:

Muijs et al. ['235] disclose method of and apparatus for processing seismic data.

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Barr et al. ['028] disclose method for correcting impulse response differences of hydrophones and geophones as well a geophone coupling to the water-bottom in dual-sensor, bottom-cable seismic operations.

Contact information

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mohamed Charioui whose telephone number is (571) 272-2213. The examiner can normally be reached Monday through Friday, from 9 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eliseo Ramos-Feliciano can be reached on (571) 272-7925. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mohamed Charioui

1/19/09

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Examiner, Art Unit 2857